6.2 Working With Integer Exponents

Investigate: Using patterns to evaluate powers. No decimals
Complete the statements below and then describe the pattern.

$2^5 = 32$ ÷2
$2^4 = 16$ ÷2
$2^3 = 8$ ÷2
$2^2 = 4$ ÷2
$2^1 = 2$
$2^0 = 1$
$2^{-1} = \frac{1}{2}$
$2^{-2} = \frac{1}{4}$

$3^3 = 27$ ÷3
$3^2 = 9$ ÷3
$3^1 = 3$
$3^0 = 1$
$3^{-1} = \frac{1}{3}$
$3^{-2} = \frac{1}{9}$

positive ,zero and negative exponents all follow a pattern

note your BASE cannot be 0

Zero Exponent

In General:

$$a^0 = 1$$

Negative Exponent:

In General:

$$a^{-n} = \frac{1}{a^n}$$

In Words:

Invert the base and put to a positive exponent

Extend the rule:

$$\left(\frac{a}{b}\right)^n = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$$

Practice time....

Evaluate (Leave answers in fractional form):

a) 2^0 $=1$

b) $(-2)^4$ $=+16$

c) -2^4 $=-16$

d) $(-3)^5$ $=-243$

e) 2^{-4} $=\frac{1}{2^4}=\frac{1}{16}$

f) -2^{-4} $=-\frac{1}{16}$

g) -3^0 $=-1$

h) 3^{-2} $\frac{1}{9}$

Simplify:(write as a single power with positive exponents)

a) $\left(\left(4^3\right)^{-2}\right)^{-1}$

$=4^6$

b) $\frac{\left(\left(3^{-1}\right)^{-2}\right)^{-1}}{3^4(3)^2}$

$=\frac{3^{-2}}{3^3}$

$=\frac{\frac{1}{3^2}}{3^3}$

$=\frac{1}{3^2}\div\frac{3^3}{1}$

$=\frac{1}{3^2}\times\frac{1}{3^3}$

$=\frac{1}{3^5}$

c) $\left(\frac{\left(4^3\right)^2}{4\left(4^6\right)}\right)^{-1}$

$=\left(\frac{4^6}{4^7}\right)^{-1}$

$=\left(\frac{4^7}{4^7}\right)^1$

$=4$

Simplify: answer should positive exponents; leave in fractional form

a) $5^{-4}\left(5^{-2}\right)^{-1}$

$=5^{-4}\left(5^2\right)$

$=5^{-2}$

$=\frac{1}{5^2}$

b) $\left(\frac{2}{5}\right)^{-3}\times\left(\frac{2}{5}\right)^4\div\left(\frac{2}{5}\right)^{13}$

$=\left(\frac{2}{5}\right)^1\div\left(\frac{2}{5}\right)^{13}$

$=\left(\frac{2}{5}\right)^{1-13}$

$=\left(\frac{2}{5}\right)^{-12}\rightarrow\left(\frac{5}{2}\right)^{12}$

Evaluate:

a) $3^{-2}-2^{-3}$

$=\frac{1}{9}-\frac{1}{8}=-\frac{1}{72}$

$=\frac{8}{72}-\frac{9}{72}=$

b) $\left(\frac{1}{2}\right)^{-3}+\left(\frac{1}{4}\right)^{-1}-5^0$

$=8+4-1$

$=11$

Determine the value of the variable that make each of the following true:

a) $10^x = 10000000$ Hint: count the zeros

$x = 7$

10^7

b) $3^n = \frac{1}{3}$

$n = -1$

3^{-1}

c) $10^y = 0.00000001$ Hint: small number you need a neg exponent remember your base is 10 the decimal needs to move one more space the number of zeros after the decimal

$y = -8$

d) $8^m = \frac{1}{64}$

$m = -2$

8^{-2}

Simplify each expression, answer with positive exponents

a) $\frac{y^{-4}(x^2)^{-3}y^{-3}}{x^{-5}(y^{-4})^2}$

$= \frac{x^{-6}y^{-7}}{x^{-5}y^{-8}}$

$= x^{-6}y^{-7} \div x^{-5}y^{-8}$

$= x^{-1}y$

$= \frac{y}{x}$

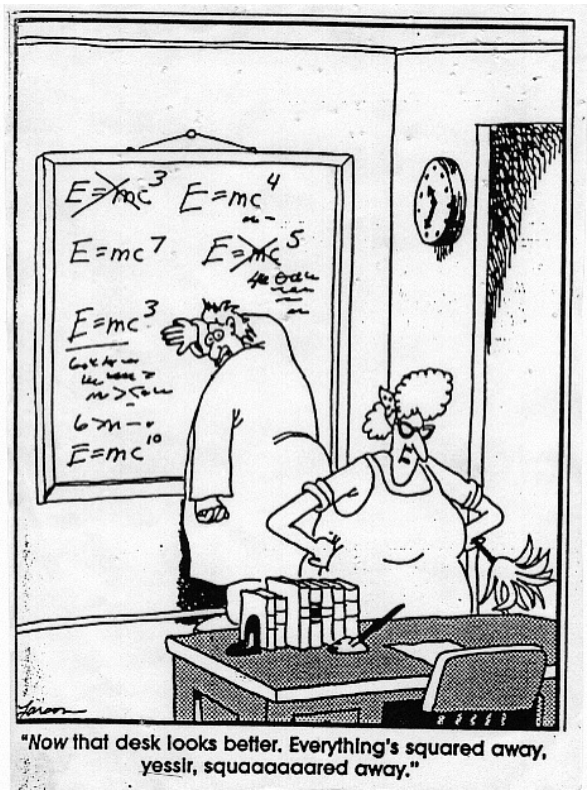
b) $\frac{x^{-3}(y^{-1})^{-2}}{(x^{-5})(y^4)}$

$= \frac{x^{-3}y^2}{x^{-5}y^4}$

$= x^2y^{-2}$

$= \frac{x^2}{y^2} \rightsquigarrow \left(\frac{x}{y}\right)^2$

Hmwk:
p 408 # 4, 5 cdef,
6, 7, 9, 11 adf, 12, 13



"Now that desk looks better. Everything's squared away, yessir, squaaaaaared away."